MUSIC GENRE CLASSIFICATION

PROJECT DETAILS:

- DATASET:
  Source:
  The GTZAN dataset used in this project is sourced from Kaggle
  Link: https://www.kaggle.com/datasets/andradaolteanu/gtzan-dataset-music-genre-classification?resource=download

Contents:

- **genres original** - A collection of 10 genres with 100 audio files each, all having a length of 30 seconds
- **images original** - A visual representation for each audio file. (not needed in this project)
- **2 CSV files** - Containing features of the audio files. **(**features_3_csv & features_30_csv)

  Data Loading:

- Loaded data from two CSV files into Pandas DataFrames (df1 and df2) and concatenated to a single dataframe(df)
  Preprocessing:
- Dropped unnecessary columns from the dataframe
- Transformed categorical data into numeric format
- Formed a lookup_genre_name dictionary for mapping numerical codes to genre labels.
- Split data into 75% training and 25% testing sets.
- Standardized features using StandardScaler for better KNN performance.
  Model Training:
- Used Random Forests to evaluate feature importance.
- Developed a K-Nearest Neighbors (KNN) model with hyperparameters optimized via GridSearchCV.
  Model Evaluation:
- Evaluated the model's effectiveness by analyzing accuracy and generating a classification report.
  GUI Implementation:
- Designed a user interface using the Tkinter library.
- Created predict_genre_by_filename function to predict genre from selected audio files by preprocessing, scaling, and using the trained model.

CHALLENGES& SOLUTIONS:

1. **Feature Scaling:** The KNN model's performance was affected by inconsistent scaling of training and testing features.
   Solution: Applied StandardScaler to both training and testing data to ensure uniform scaling. This improved the model's performance by providing consistently scaled data for training and prediction.
2. **Optimizing Model performance**: The initial KNN model had low accuracy in classifying music genres.
   Solution: Used GridSearchCV to find the best hyperparameters, which significantly improved the model's accuracy based on cross-validation results.

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VISUALS:

GUI:
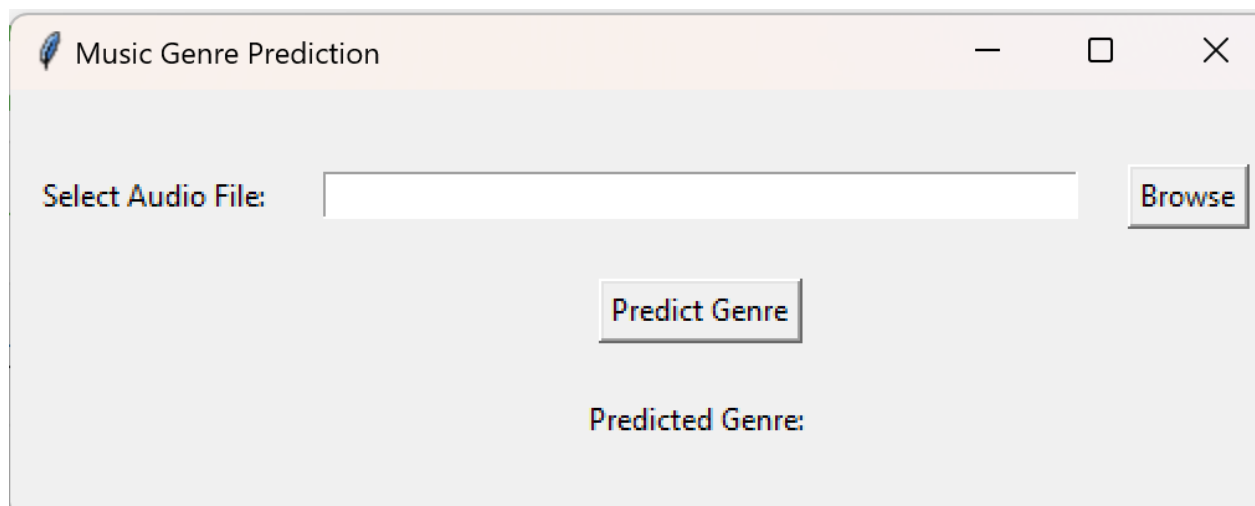
REFERENCES:

1. Used Kaggle for accessing the GTZAN Music Genre Dataset and for understanding few machine learning concepts
2. Youtube tutorials